Range Survey of the Rosebud Battlefield State Park
By
Eugene J. Handl
Grazing Management Consultant
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COPY

On May 1& 2, 2006, accompanied by Cathy Stewart, I made a range site and condition survey of the Rosebud Battlefield State Park. The range sites were determined from the Big Horn County Soil Survey. Range condition and estimated stocking rates were determined using the Montana Grazing Guides, USDA-SCS, 1977, for the Eastern Sedimentary Plains, 15-19 Inch Precipitation Zone.

The abundance of Idaho fescue, especially on the north slopes, is an indication that this area receives about 14-16 inches of annual precipitation. The ability of the pubescent wheatgrass, which was seeded on the uplands north of Rosebud Creek, to persist for over 20 years also indicates that this area receives about 14-16 inches of annual precipitation.

My assessment of the overall average range condition in Rosebud Battlefield State Park is that it is about 50% range condition. This is the midpoint between Fair and Good Condition according to the Montana Grazing Guides. The stocking rate for the area is estimated to be about 743 animal unit months of available forage. Please keep in mind that this number is an estimate only and is to be used as a starting point until actual use data proves otherwise. No cuts have been made to account for poor livestock accessibility. This estimate will need to be reduced if the Park is grazed during the growing season without developing stock water and installing fences in strategic locations.

The Park is divided into three major fields. The North Field contains about 1600 acres with an estimated 376 animal unit months of potential grazing. The major range site in this pasture is the thin hills range site. The thin hills range site contains a mixture of soils that range from the normal upland soils with few restrictions to plant growth, such as silty or clayey range sites, to the steep slopes with shallow soils and rock outcrops that produce less vegetation. There is an extensive area of silty and clayey range site that has been reseeded to pubescent wheatgrass. Other introduced plants such as Russian wildrye, crested wheatgrass and alfalfa were also noted in various areas in the Park.

The Middle Field contains about 146 acres on both sides of Rosebud Creek. Estimated stocking rate would be about 62 animal unit months of grazing. Except for the very wet and swampy areas this pasture contains mostly introduced species such as crested wheatgrass, pubescent wheatgrass and some alfalfa. This field was apparently used for hay production when this was a working ranch.

The South Field contains about 1300 acres with an estimated 305 animal unit months of potential grazing. The thin hills range site makes up about ½ of this pasture with the rest being made up of clayey, silty and shallow range sites. There is over 100 acres of crested wheatgrass adjoining the middle field that may have been used for hay production when this was a working ranch.

From a grazing management standpoint the Rosebud Battlefield State Park is extremely short on livestock water. There is one reservoir in the north end of the North Field and this year it was nearly dry at the time of our range survey. The only other stock water source is Rosebud Creek. Livestock would have to travel 2 miles from the water source on Rosebud Creek to graze the north side of the Park. In the South Field, livestock would have to travel a mile from water and climb 300 feet of fairly steep slopes to access the 250 acre bench. The southeast corner of the South Field is 2 miles from stock water and is accessible by climbing over a 150 foot ridge. The poor distribution of livestock water presents a very difficult problem for good grazing management.

Rosebud Battlefield State Park shows the effects of overgrazing at sometime in the past. Today the range seems to be in a recovery stage. The problem now appears to be under-grazing which has led to a heavy build up of mulch that is restricting healthy plant growth in some areas. The excessive buildup of mulch is also creating a fuel load for a potential wild fire. The Park needs grazing. A practical way to graze the Park with domestic livestock under the current conditions and have the least detrimental effects on the rangeland is to graze with non-lactating cows during the late fall or early winter months. At this cooler time of year, without their calves, the cows will tend to graze farther from water. Salt or other supplements could be placed a mile or so away from the creek to encourage grazing the outlying areas in each field. Even so, it will be difficult to get the animals to graze the less accessible areas far away from stock water. Size of herd can be a factor in that the larger the herd and the shorter the grazing period, the less detrimental effects there will be on the vegetation.

For example, it might be possible to bring in 500 cows after the first of November for 1.5 months and graze them on the North Field one year. The next year they would be grazed on the South Field for the same time period while the North Field receives non- use. This might be a practical way to force utilization away from the water and provide a full year of non-use every other year to overcome any detrimental effects before grazing again. Heavy grazing after November 1 when the plants are dormant would have the least detrimental effect on the plant communities, when compared to grazing during the growing season, especially when followed by a complete year of non-use.

Winter grazing with a herd of sheep and a herder might be another alternative to consider. A good sheep herder could control how and where the vegetation was utilized.

The Middle Field along Rosebud Creek should be grazed as a separate grazing unit. Using the example of 500 cows, this field would be pretty well used in 4-6 days with little damage to the resource. It could probably be used every year in this manner.

Should this method of grazing be unsatisfactory, perhaps a strategically located well could be developed in each of the North Field and the South Field which could better distribute the livestock. Stock water pipelines from the creek could also be an option. A fencing arrangement could also be designed and installed to better control the animals. The planning of additional stock water and a fencing arrangement could be done at a later date if there is interest in this option.

Two Questions were posed after preliminary review of the above report. The first question was: How can we help the range improve throughout its "recovery" stage? And two: What would be a "ballpark" time frame to get the rangeland closer to excellent condition?

The range will improve to some extent by doing nothing as it probably has since it was acquired by the State. But our rangelands evolved under grazing pressure so it is likely that the rangeland will improve faster if it is grazed using a high level of grazing management. Manipulation of the grazing animals is the quickest way to speed range recovery. It would seem that the most practical and least costly way for the Park to graze this land would be to graze in late fall-early winter when there would be the least human conflict. Grazing at this time of year would have the least detrimental effects on the vegetation and should speed plant succession to a higher level.

There is no clear answer as to how long it will take for the rangeland to improve to excellent condition. With a grazing system as suggested above, or some variation of it, I would expect to see some improvement in 10 years or so depending upon the weather. Drought will certainly slow recovery whereas a series of wet years would speed recovery.

It would be well to consider setting up some kind of monitoring system to document any changes. For instance, permanent photo plots could be installed on some of the key range sites with a percentage estimate of the amount, by weight, of each species in the plant community. These plots could be re-photographed and re-estimated at the same time of the year every 5 years or so to document any changes. Mid-June through July would be the best time for this activity.

Enclosures:

- Pasture Summary worksheet
- Range Site Criteria
- Grazing Guide – Eastern Sedimentary Plains
- Mont Guide – MT 8515
- Mont Guide – MT 9111

PASTURE SUMMARY WORKSHEET
(Carrying Capacity Estimate)

RANCH: Rosebud Battlefield State Park DATE: May - 2006 TECHNICIAN: Hindl

Field No.	Land Use or Site & Condition	AUM/Ac.	Acres	AUM's	PASTURE TOTALS Acres	PASTURE TOTALS AUM's*
	Precipitation Zone 15-16" Eastern Sedimentary Plains					
NORTH	Silty FC+	.25	156	39	1600	376
	Thin Hilly FC+	.20	1087	217		
	Pubescent wheatgrass	.35	280	98		
	Silty GC	.30	60	18		
	Clayey FC	.25	17	4		
MIDDLE (CREEK)	WETLAND & OVERFLOW	.40	60	24	146	62
	Pubescent/Crested wheatgrass	.50	72	36		
	Clayey FC	.35	14	2		
South	Crested wheatgrass	.50	105	52	1300	305
	Clayey FC	.15	40	6		
	Thin Hilly FC+	.20	660	132		
	Silty FC+	.25	240	60		
	Clayey GC	.30	35	11		
	Shallow FC+	.20	220	44		
				TOTALS =	3046	743

*AUM's = Animal Unit Months (or Cow Months) of grazing.

RANGE SITE CRITERIA

Range sites are kinds of rangeland that differ from each other in their ability to produce a significantly different kind or amount of climax or original vegetation. Only natural grasslands are classified as range sites. In order to fully designate a range site, a soil-group name is combined with the precipitation zone and geographic location; e.g., Sandy, 10-14" p.z., Glaciated Plains, Montana.

The following range soil-groups are listed in presumed order of natural productivity, considering total air-dry weight of all herbage produced through the entire year by all seed plants per unit of area, in ordinary years under climax plant cover.

I. Soil-groups that can produce more herbage than ordinary range uplands because of plainly superior soil moisture availability.

WL - WET LAND: Lands where seepage, ponding, etc. raises the water table to above the surface during only a part of the growing season. Too wet for cultivated crops but too dry for common reed, cattails, or true aquatics.

Sb - SUBIRRIGATED: Lands with an effective subsurface ground water table and water rarely over the surface during the growing season.

SL - SALINE LOWLAND: Subirrigated and overflow lands where salt and/or alkali accumulations are apparent and salt tolerant plants occur over a major part of the area.

Ov - OVERFLOW: Areas regularly receiving more than normal soil moisture because of run-in or stream overflow.

II. Soil-groups with no obvious soil or moisture limiting factors. The vegetation can make a normal response to climate.

Sa - SANDS: Sands and loamy sands more than 20 inches deep.

Sy - SANDY: Coarse to fine sandy loams more than 20 inches deep.

Si - SILTY: Soils more than 20 inches deep of very fine sandy loam, loam, or silt loam. This includes soils with two inches or more loam or silt loam over clayey subsoils.

Cy - CLAYEY: Granular clay loam, silty clay loam, silty clay, sandy clay or clay more than 20 inches deep.

III. Soil-groups with characteristics or topographic features that limit moisture-holding capacity or affect infiltration rates.

TH - THIN HILLY: Loamy or clayey soils on steep or hilly landscapes (over 20 percent slopes) with a thin A horizon and weak or no structure in the subsoil,but with potential root penetration

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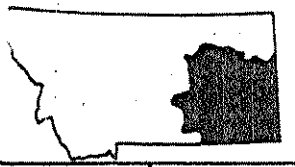
U. S. Department of Agriculture
Soil Conservation Service
April 1977

A GUIDE TO RANGE SITE CONDITION CLASSES AND RECOMMENDED STOCKING RATES IN THE EASTERN SEDIMENTARY PLAINS OF MONTANA 15-19" PRECIPITATION ZONE



Part I. ECOLOGICAL POSITION OF INDIVIDUAL SPECIES IN THE CLIMAX COMMUNITY AND RESPONSE TO GRAZING BY CATTLE

DECREASERS /1	INCREASERS /2	MAXIMUM PERCENT OF INCREASERS (DRY WEIGHT) PRODUCED ANNUALLY IN CLIMAX BY RANGE SITES *																	
		WL	Sb	SL	Ov	Sa	Sy	Si	Cy	TH	SwC	SwC	Sw	Ps	DC	TB	VS	SU	Sh
American sloughgrass	Blue grama	-	-	-	-	-	-	5	5	-	-	5	5	5	-	5	5	-	-
Alkali sacaton	Idaho fescue	-	-	-	-	-	10	10	10	10	-	-	-	--	-	-	-	-	-
Basin wildrye	Needleandthread	-	-	-	-	5	15	15	-	15	-	20	15	15	-	15	15	-	-
Bearded wheatgrass	Plains reedgrass	-	-	-	-	-	-	-	5	-	5	-	-	5	5	-	-	d	d
Big bluestem	Prairie junegrass	-	-	-	-	-	5	5	5	5	5	5	5	-	-	5	5	-	-
Bluebunch wheatgrass	Saltgrass	-	-	20	-	-	-	-	-	-	-	-	-	5	5	5	-	d	d
Canada wildrye	Sand dropseed	-	-	-	-	5	5	5	-	-	-	5	-	-	-	5	5	-	-
Canby bluegrass	Sandberg bluegrass	-	-	-	-	-	-	-	-	-	-	5	5	5	5	-	5	5	5
Columbia needlegrass	Squirreltail	-	-	5	-	-	-	-	-	-	-	-	-	5	5	-	-	5	d
Cordgrasses	Western & thickspike wheatgrass	-	20	25	30	5	10	25	30	25	30	d	d	d	d	d	d	d	d
Green needlegrass	Sedge increasers	25	15	5	-	-	10	5	-	5	-	5	5	-	-	5	5	-	-
Indian ricegrass	Forb increasers	5	5	5	10	10	10	10	10	10	10	10	10	5	5	10	5	5	5
Little bluestem	Coniferous trees	-	-	-	-	-	-	-	-	5	10	5	5	-	-	5	10	-	5
Mountain bromes	Big sagebrush	-	-	-	-	-	-	5	5	5	5	-	-	5	5	5	-	-	-
Nuttall alkaligrass	Greasewood **	-	-	20	-	-	-	-	-	-	-	-	-	5	-	-	-	15	d
Plains muhly	Silver sagebrush	-	-	-	5	-	5	-	-	5	-	-	-	-	-	-	-	-	-
Porcupinegrass	Other woody inc.	10	15	10	15	5	5	5	5	5	5	5	5	-	-	5	5	-	-
Prairie sandreed																			
Sand bluestem																			
Sideoats grama																			
Slender wheatgrass																			
Switchgrass																			
Tall reedgrasses																			
Tufted hairgrass																			
Sedge decreasers																			
Forb decreasers																			
Woody decreasers																			

*The symbol "-" means the species has less than 2½% coverage or is not present in the climax vegetation of the site.
The symbol "d" means the species is a decreaser on the site and the amount present is considered climax. WT - WET LAND; Sb - SUBIRRIGATED; SL - SALINE LOWLAND; Ov - OVERFLOW; Sa - SANDS; Sy - SANDY; Si - SILTY; Cy - CLAYEY; TH - THIN HILLY; SwC - SHALLOW CLAY; Sw - SHALLOW TO GRAVEL; Sw - SHALLOW; Ps - PANSPOTS; DC - DENSE CLAY; TB - THIN BREAKS; VS - VERY SHALLOW; SU - SALINE UPLAND; Sh - SHALE.
Range sites are described with determinant features in the Technical Guide, Section II-E-3.
**Decreases with summer grazing.

INVADERS /3
(Annuals, introduced species, or natives that make up less than 2½% in climax)

Annual bromes
Canada bluegrass
Foxtail barley
Kentucky bluegrass
Threeawns
Tumblegrass
Bull thistle
Canada thistle
Curlycup gumweed
Dandelion
Knapweeds
Leafy spurge
Sandwort
Toadflaxes
Western ragweed
Woolly Indianwheat
Broom snakeweed
All other annuals and biennials
All other exotics

Part II. GUIDE FOR MAKING RECOMMENDATIONS ON STOCKING

A. Guide to Departures From Basic Table by Range Sites. /4

WET LAND sites use three times the value for the 20-24" P.Z.
SUBIRRIGATED use two times the value of the 20-24" P.Z.
SALINE LOWLAND and OVERFLOW use values one-half to one zone higher than P.Z. where located.
SANDS, SANDY, SILTY, and CLAYEY use values for the P.Z. where located.
THIN HILLY, SHALLOW CLAY, SHALLOW TO GRAVEL, SHALLOW, PANSPOTS, and DENSE CLAY use values one-half to one zone lower than the P.Z. where located.
THIN BREAKS use values one and one-half zones lower than the P.Z. where located.
VERY SHALLOW, SALINE UPLAND, and SHALE use values one and one-half to two zones lower than the P.Z. where located but not less than one-half the value for the 5-9" P.Z.

B. Basic Table for Normal Soils of Each Precipitation Zone

Average Annual Precipitation Zone (Inches)	Range Condition Percentage and Classes 100 - EC - 75 - GC - 50 - FC - 25 - PC (Animal Unit Months Per Acre) /5			
25-29	1.0	.75	.5	.25
20-24	.8	.6	.4	.2
15-19	.6	.45	.3	.15
10-14	.4	.3	.2	.1
5-9	.2	.15	.1	.05

/1 Climax species that decrease with grazing pressure by cattle. No limit to amount in climax. In determining range condition count percentage found on the site.
/2 Climax species that increase with disturbance. In determining range condition, count present amount not to exceed maximum percentage for the site.
/3 Do not count any invaders in determining range condition.
/4 Departures do not include utilization cuts because of inaccessibility. Apply any necessary cut to grazing unit after AUM's are totaled.
/5 All stocking rates may be higher if grazing is limited to season of complete dormancy.

TABLE 2. Range condition guide.
Maximum Percent Allowable in Climax by Range Site

		10—14" pz								15—19" pz							
		Group I		Group II			Group III			Group I		Group II			Group III		
		Sb	Ov	Sy	Si	TSi	Cy	Sw	Vs	Sb	Ov	Sy	Si	TSi	Cy	Sw	Vs
LASS DECREASERS																	
sin wildrye		20	40								40						
arded wheatgrass		10	20														
; bluestem		10	45	10	10		15										
iebunch wheatgrass			10	25	50	40	40	60	60			20	70	70	50	70	80
lumbia needlegrass											15	5	15		5		
rdgrasses		40	40														
een needlegrass		10	25	30	40	25	55	20	15								
tle Bluestem				30		30		30	30								
ountain Brome												10	10	10	10	10	
airie sandreed			10	55				15	10								
ugh fescue											20	25	75	40	40	70	
braska sedge		30	10	15	10	10	15	10	5								
nder wheatgrass		20	20														
ifted hairgrass		15	10							10	10						
her decreaser grasses		10	10	10	15	15	15	10	15	10	10	10	15	15	15	10	15
FORB DECREASERS		10	10	10	15	10	15	15	10	10	10	15	15	15	15	15	30
SHRUB DECREASERS		10	10	10	5	5	5	5	5	15	15	15	15	15	15	15	30
RASS INCREASERS																	
ue grama			5	5	5	5	5	5	5								
aho fescue					10		5		5	15		20	20	20	20	15	15
edleandthread				25	20	15		20	20			5				5	10
airie junegrass				5	5	5	5	5	5								
ndberg bluegrass				5	5	5	5	5	5								
dge increasers				5	5	5		5	5								
ickspike and																	
Western wheatgrass		15	50	10	40	20	50	20	30		15				20	10	5
ther increaser grasses		10	10	10	15	15	15	10	15	10	10	10	15	15	15	10	15
FORB INCREASERS		10	10	10	5	5	5	5	5	10	10	10	15	15	15	10	15
HRUB INCREASERS																	
ig sagebrush			5	x	5	x	5	5					10	10	10	5	
lver sagebrush		5	5	5	5	5	5	5	5								
abbitbrushes		5	5	5	5	5	5	5	5								
room Snakeweed		5	5	5	5	5	5	5	5								
ther shrub increasers		5	10	10	10	10	10	10	15	15	15	15	15	15	15	15	15
NVADERS																	
ny annuals or biennials																	
ny introduced plant																	
ed threeawn																	
ther invaders																	
itial Stocking	E	.6	1.6	.4	.4	.4	.3	.3	.08	.8	1.6	.6	.6	.65	.5	.5	.2
ate: AUMs/Acre	G	.45	1.2	.3	.3	.3	.22	.22	.06	.6	1.2	.45	.45	.45	.37	.37	.15
y Range Condition	F	.3	.8	.2	.2	.2	.15	.15	.04	.4	.8	.3	.3	.3	.25	.25	.1
	P	.15	.4	.1	.1	.1	.07	.07	.02	.2	.4	.15	.15	.15	.12	.12	.05
itial Stocking	E	1.6	.6	2.5	2.5	2.5	3.3	3.3	12.5	1.3	.6	1.7	1.7	1.6	2.0	2.0	5.0
ate; Acres/AUM	G	2.2	.8	3.3	3.3	3.3	4.5	4.5	16.7	1.7	.8	2.2	2.2	2.2	2.7	2.7	6.7
y Range Condition	F	3.3	1.2	5.0	5.0	5.0	6.7	6.7	25.0	2.5	1.2	3.3	3.3	3.3	4.0	4.0	10.0
	P	6.7	2.5	10.0	10.0	10.0	14.3	14.3	50.0	5.0	2.5	6.7	6.7	6.7	8.3	8.3	20.0

Responds as invader in foothills and mountains

ANGE SITE: Ov-Overflow; Sb-Subirrigated; Sy-Sandy; Si-Silty; Cy-Clayey; TSi-Thin Silty; Sw-Shallow; Vs-Very Shallow.

Game and non-game animals also consume forage. Accurate determinations are complicated by incomplete knowledge of quantitative forage requirements, their dietary habits compared with domestic stock, the efficiency of animals in making use of feeds and the extent to which they utilize the same areas as domestic stock. Therefore, the estimated comparative feed requirements of game and domestic stock should be used with caution (Table 3).

The big game numbers in Table 3 apply to mature animals. Just as offspring of livestock are considered to exert additional demand for forage when they reach two to four months of age, offspring of wildlife should also be considered. Failure to do so will underestimate grazing use, and could lead to range deterioration.

Balancing livestock numbers with available forage is a basic goal and principle of range management. Forage productivity benefits when livestock are evenly distributed, spring grazing is delayed, and plants are provided periods of rest between grazing periods. Information about stocking rates, range condition, rainfall, and grazing patterns should be collected and evaluated. Grazing management programs should be adjusted when the need arises.

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AGRICULTURE

MONTANA GUIDE TO RANGE SITE, CONDITION AND INITIAL STOCKING RATES

by

John Lacey and John E. Taylor*

INTRODUCTION

Rangeland is land that produces grass, forbs and shrubs that can be harvested by grazing animals. Plants and animals on rangeland function as a unit, and any change in one factor (such as fire or grazing), changes the whole complex. For an optimal yield of livestock, wildlife and recreation, the number of grazing animals must be balanced with available forage. This publication explains how to identify range sites, classify range condition and estimate stocking rates.

*This is a training guide. . .*to be used to learn the concepts and procedures. Actual range analysis should be based upon more complete information, such as that available from the appropriate state and federal agencies.

RANGE SITES

The relationship between the plant community and the environment must be understood. A range site is a distinct kind of rangeland that has a certain potential to produce a distinct plant community (Fig. 1). The plant community that developed and matured under natural conditions is called the "climax" vegetation of the site. As long as the environment remains unchanged, range sites retain their capacity to reproduce the climax plant community following disturbances.

The kinds and amount of vegetation growing within plant communities are determined by topography, climate, exposure, level of water table and in the depth, texture, structure and salinity of the soil. Although all parts of the environment have the potential to influence the vegetation on a site, precipitation probably is the single, most important factor. Good range management can improve forage production, forage variability, seasonal distribution and water intake. Water intake is correlated with the amount of old and new vegetation that is left to protect the soil from erosion and crusting.

Different kinds of rangeland often are classified according to availability of soil moisture. "Normal" range sites allow vegetation to make a normal response to climate, and are not affected by soil or moisture-limiting factors. However, coulees and bottomlands often are designated as "run-in" sites because they have superior soil moisture availability and can produce more vegetation. In contrast, "run-off" sites have topographic features or characteristics that limit soil moisture availability and produce less vegetation than "normal" sites.

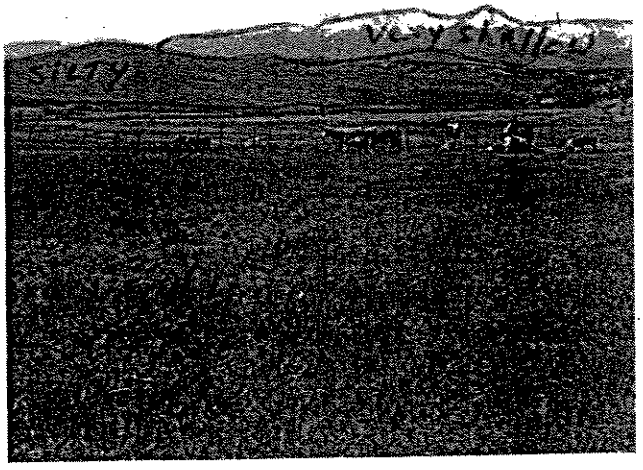

FIGURE 1. Each range site produces a different kind and/or amount of vegetation and often requires a unique management strategy.

Determing Range Sites.

Plants often can be used as a clue to classify certain range sites. However, heavy grazing, drought, fire or tillage may change or destroy the vegetation. Thus, a site usually cannot be identified solely upon vegetation. The more the site has been distrubed, the greater the change in the climax vegetation. When the original vegetation is altered, the site must be identified on the basis of kind of soils, climate and topography.

The first step in identifying range sites is to select a representative location within each area, dig a small hole and examine the soil characteristics. The Range Site Key (Table 1) can be

*Extension range specialist and associate professor, Department of Animal and Range Sciences, Montana State University.

used to properly identify range sites.

TABLE 1
Key to Common Montana Range Sites*

To identify a range site, first determine which one of these three questions can be answered "yes."

1. Does the site receive additional moisture from overflow or subirrigation, or does it have a water table at least part of the growing season? If yes, go to GROUP I; if no, go to the next sentence.
2. Is the soil depth at least 20 inches, with no sign of significant additional moisture? If yes, go to GROUP II, if no, go to next sentence.
3. Is the soil depth less than 20 inches to bedrock? If yes, go to GROUP III; if no, start over.

GROUP I—Range Sites That Receive Additional Moisture

SITE NAME

1. Is the groundwater within 20 to 40 inches of the surface at least during part of the growing season?
   If YES, the range site is ..... **Subirrigated (Sb)**
   If NO, go to next sentence.
2. Is there additional moisture from runoff of nearby slopes or stream overflow?
   If YES, the range site is ..... **OVERFLOW (Ov)**
   If NO, go back and see if you are in the right group, and try again.

GROUP II. Soil at Least 20 Inches Deep—No Additional Moisture.

1. Is the surface layer a gritty, coarse texture, not sticky when moist, and does water drain through the soil fairly fast?
   If YES, the range site is ..... **SANDY (Sy)**
   If NO, go to the next sentence.
2. Is the surface layer a medium (silty) texture that feels smooth or slightly gritty and slightly sticky and is the surface layer limy and strongly effervescent? Are the soils on a moderately steep or steep bench edge or slopes of hills?
   If YES, the range site is ..... **THIN SILTY (TSi)**
   If NO, go to the next sentence.
3. Is the surface layer a medium (silty) texture that feels smooth or slightly gritty and slightly sticky? (The soils are on nearly level to moderately steep slopes.)
   If YES, the range site is ..... **SILTY (Si)**
   If NO, go to the next sentence.
4. Is the surface layer a fine (clayey) texture that is sticky and plastic? (The soil ribbons when moist.)
   If YES, the range site is ..... **CLAYEY (Cy)**
   If NO, go back and see if you are in the right group, and try again.

GROUP III. Soil Less Than 20 Inches Deep

1. Is the soil depth between 10 and 20 inches, over granite, sandstone, siltstone or shale?
   If YES, the range site is ..... **SHALLOW (Sw)**
   If NO, go to the next sentence.
2. Is the soil depth less than 10 inches to hard bedrock (except for crack in rock)?
   If YES, the range site is ..... **VERY SHALLOW (Vs)**
   If NO, go back and see if you are in the right group, and try again.

**For actual range site mapping, use the comprehensive "Key to Montana Range Sites" available at Soil Conservation Service, Bureau of Land Management offices and county Extension Service offices.*

RANGE CONDITION

Range condition or range health is the present state of the vegetation, compared to the kind and amount of native vegetation the range site is capable of producing. Vegetation comparisons are based on the relative weight of species, not on plant density, vigor or erosion. Estimates should be made to the nearest 5 percent for each species or group. The *total* always is 100 percent. While a major departure from climax indicates poor range condition, a minor departure may indicate good condition.

Plant Response to Cattle Grazing

To assist in determing the range condition class for a range site, plant species are grouped as decreasers, increasers or invaders, based primarily on the response to grazing pressure. *Decreasers* are high producing, palatable plants that grow in the original climax community. These plants decrease in relative abundance under continued heavy use. In calculating range condition, count the total of each decreaser species, up to the amount shown in the guide, which represents the amount that was present in climax condition.

Increasers are lower producing, less palatable plants that also grow in the original climax community. They tend to "increase" and take the place of decreasers that weaken or die due to heavy grazing, drought or other range disturbances. The increasers, also will be weakened by continued close grazing and decline in abundance. In calculating range condition, the amount of increaser plants counted must not exceed the maximum level shown on the range condition guide.

Invaders are introduced plants or native plants that are rare in the climax plant community. They invade a site as the decreasers and increasers are reduced by grazing or other disturbances. In calculating range condition class, invaders are not counted for range condition.

The relationship between decreasers, increasers and invaders in range condition classes is shown in Fig. 2. The deviation from climax is divided into excellent (76 to 100 percent of climax), good 51 to 75 percent of climax), fair (26 to 50 percent of climax) and poor (0 to 25 percent of climax) range condition classes. The total decreasers, increasers and invaders always is 100 percent, and is based upon air-dry weight of the current growth.

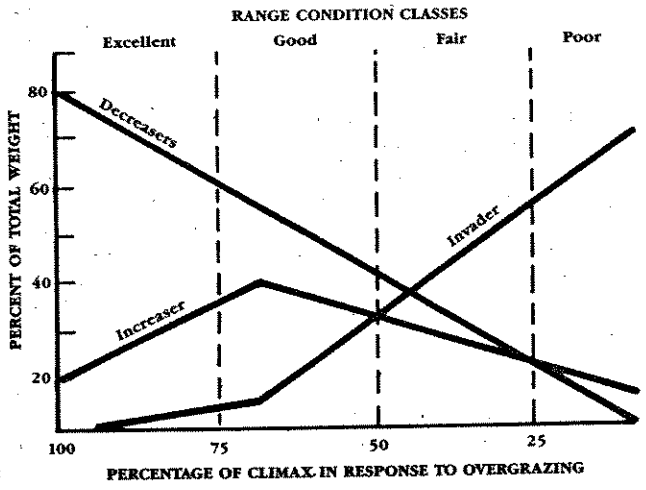

FIGURE 2. Relationship between decreasers, increasers and invaders.

Determining Range Condition

The first step in estimating range condition is to select locations within the range sites and estimate species composition by weight. These estimates should not be made in "sacrifice areas" adjacent to livestock waters nor in areas that receive little livestock use. The locations should have a plant community that is "representative" for the site.

List the species growing on the site, and estimate the percentage each contributes to total weight. Your estimates can be checked by clipping and weighing the herbage of each species within selected plots.

Determine the precipitation zone that describes the site (10-14 or 15-19 inch) and list the estimated allowable percentages of each species from Table 2. Compare these values to your estimates. The lesser amount of each decreaser and increaser species is used in calculating range conditon. Do not include invaders in calculations. The sum of the decreaser and increaser species determines if the range condition is classed as excellent (76-100), good (51-75), fair (26-50) or poor (0-25).

The following example shows how to calculate range condition percentage on a shallow range site in the 10-14 inch precipitation zone. First, list the on-site vegetation and estimate how much each contributes to total current-year production. Assume that the species or types make up the percentages shown as on-site estimates in the following table. To estimate condition, we compare the present plant production to the maximum allowable percentage listed on the condtion guide:

Plant	On-Site Estimate	Condition Guide (Shallow site, 10-14 pz)	Count
Bluebunch wheatgrass	40	60	40
Green needlegrass	15	20	15
Forb decreasers	5	15	5
Needle-and-thread	15	20	15
Western Wheatgrass	5	20	5
Other shrub increasers	15	10	10
Invaders	5	0	0
	100%		90

So range condition percentage is 90 percent, or excellent condition.

STOCKING RATES

Recommended stocking rates are based upon results from grazing research, local experience and clipped-plot yields. Recommended range site stocking rates are summarized at the bottom of the range condition guide (Table 2).

Initial stocking rates also are influenced by season of use, kind and class of livestock, amount of wildlife use, prolonged drought, series of wet years and other factors. Physical limitations (such as steep slopes and distance from water) that cause certain portions of the range to be under-used also affect them. Under adverse conditions, the stocking rate must be reduced to avoid overuse of the more accessible parts of the range. In addition to proper stocking, good grazing management requires a systematic plan that includes such factors as good livestock distribution, correct season of use and control of the grazing period.

Animal Unit Equivalents

In planning the use of rangelands, the standard livestock unit is the *animal unit* defined as one mature (1,000 lb.) cow, with or without an unweaned calf. Stocking rates are often expressed in animal unit months (AUMs) per acre, which is one animal unit grazing for one month on the specified number of acres. Animal unit equivalents for cattle and horses are shown below:

Cattle	
Weaned calves	0.50
Yearling	0.67
Mature cow (with or without calf)	1.00
Bulls (2 + years of age)	1.30
Horses	
Yearlings	0.75
Two-year-olds	1.00
Three + years	1.25

It often is necessary to adjust the animal unit equivalents to fit local conditions. For example, forage available may not be equally usable by different kinds of animals. Different animals also use different areas or forage species within a pasture. Thus AUM equivalents for sheep and wildlife have been omitted, because their food and habits differ from cattle.

Conclusion

Range condition and stocking rates for Montana can be estimated if the relationships between climate, soil, plants and animals is understood. The process of balancing the number of grazing animals with available forage involves the following steps:

1. Use the "range site key" to identify range sites.
2. Select locations within each range site to estimate species compositon by weight.
3. List decreaser, increaser and invader species, and estimate the percentage each contributes to the total yield.
4. Compare the percentages of each decreaser and increaser species with the estimated maximum allowable percentages, and take the lesser of the two values for each species. In most cases, all the decreaser species will be counted. The sum of these "counted" values is the percent range condition for the site.
5. Determine the stocking rate for each range site by referring to the initial stocking rate for the proper range condition class within the respective site. By summing up the available AUMs for each site within a pasture, an initial stocking rate for the entire pasture is obtained.

TABLE 2. Range condition guide.
Maximum Percent Allowable in Climax by Range Site

		10—14" pz								15—19" pz							
		Group I		Group II			Group III			Group I		Group II			Group III		
		Sb	Ov	Sy	Si	TSi	Cy	Sw	Vs	Sb	Ov	Sy	Si	TSi	Cy	Sw	Vs
GRASS DECREASERS																	
Basin wildrye		20	40								40						
Bearded wheatgrass		10	20														
Big bluestem		10	45	10	10		15										
Bluebunch wheatgrass			10	25	50	40	40	60	60			20	70	70	50	70	80
Columbia needlegrass											15	5	15		5		
Cordgrasses		40	40														
Green needlegrass		10	25	30	40	25	55	20	15								
Little Bluestem				30		30		30	30								
Mountain Brome												10	10	10	10	10	
Prairie sandreed			10	55				15	10								
Rough fescue											20	25	75	40	40	70	
Nebraska sedge		30	10	15	10	10	15	10	5								
Slender wheatgrass		20	20														
Tufted hairgrass		15	10							10	10						
Other decreaser grasses		10	10	10	15	15	15	10	15	10	10	10	15	15	15	10	15
FORB DECREASERS		10	10	10	15	10	15	15	10	10	10	15	15	15	15	15	30
SHRUB DECREASERS		10	10	10	5	5	5	5	5	15	15	15	15	15	15	15	30
GRASS INCREASERS																	
Blue grama			5	5	5	5	5	5	5								
Idaho fescue					10		5		5	15		20	20	20	20	15	15
Needleandthread				25	20	15		20	20			5				5	10
Prairie junegrass				5	5	5	5	5	5								
Sandberg bluegrass				5	5	5	5	5	5								
Sedge increasers				5	5	5		5	5								
Thickspike and Western wheatgrass		15	50	10	40	20	50	20	30		15				20	10	5
Other increaser grasses		10	10	10	15	15	15	10	15	10	10	10	15	15	15	10	15
FORB INCREASERS		10	10	10	5	5	5	5	5	10	10	10	15	15	15	10	15
SHRUB INCREASERS																	
Big sagebrush			5	x	5	x	5	5					10	10	10	5	
Silver sagebrush		5	5	5	5	5	5	5	5								
Rabbitbrushes		5	5	5	5	5	5	5	5								
Broom Snakeweed		5	5	5	5	5	5	5	5								
Other shrub increasers		5	10	10	10	10	10	10	15	Responds as invader in foothills and mountains							
INVADERS										15	15	15	15	15	15	15	15
Any annuals or biennials																	
Any introduced plant																	
Red threeawn																	
Other invaders																	
Initial Stocking	E	.6	1.6	.4	.4	.4	.3	.3	.08	.8	1.6	.6	.6	.65	.5	.5	.2
Rate: AUMs/Acre	G	.45	1.2	.3	.3	.3	.22	.22	.06	.6	1.2	.45	.45	.45	.37	.37	.15
By Range Condition	F	.3	.8	.2	.2	.2	.15	.15	.04	.4	.8	.3	.3	.3	.25	.25	.1
	P	.15	.4	.1	.1	.1	.07	.07	.02	.2	.4	.15	.15	.15	.12	.12	.05
Initial Stocking	E	1.6	.6	2.5	2.5	2.5	3.3	3.3	12.5	1.3	.6	1.7	1.7	1.6	2.0	2.0	5.0
Rate; Acres/AUM	G	2.2	.8	3.3	3.3	3.3	4.5	4.5	16.7	1.7	.8	2.2	2.2	2.2	2.7	2.7	6.7
By Range Condition	F	3.3	1.2	5.0	5.0	5.0	6.7	6.7	25.0	2.5	1.2	3.3	3.3	3.3	4.0	4.0	10.0
	P	6.7	2.5	10.0	10.0	10.0	14.3	14.3	50.0	5.0	2.5	6.7	6.7	6.7	8.3	8.3	20.0

RANGE SITE: Ov-Overflow; Sb-Subirrigated; Sy-Sandy; Si-Silty; Cy-Clayey; TSi-Thin Silty; Sw-Shallow; Vs-Very Shallow.

MONTGUIDE

MT 9111 (AG)

Agriculture

Forage Consumption Estimated Animal Unit Conversion

by
John Lacey
Extension Range Management Specialist

A common unit of measurement has been devised to estimate both the amount of forage demanded by livestock (stocking rate) and the amount of forage available (grazing capacity) in a pasture. This measurement defines a "standard animal" to adjust for differences in forage demand between kinds and classes of livestock, size of animal, and age of offspring.

The **animal unit** (AU) defines forage intake on the basis of a standard animal. The most practical "standard animal" is the cow-calf pair. We define the animal unit as a 1000-pound cow of average milking ability with a calf less than four months old. The **animal unit month** (AUM) is the amount of forage needed by an "animal unit" (AU) grazing for one month. Since daily forage requirements (on dry weight basis) of cattle average about two percent of their weight, a 1000-pound lactating cow will consume 22 pounds of forage (dry weight) per day.

Traditional British breeds of cattle were common a generation ago. Cows weighed about 900 pounds and weaned a 350 pound calf. Crossbreeding programs have increased cow size to an average of 1100 to 1300 pounds. Larger cows require more energy for maintenance and for greater milk production. In addition, modern calves are bigger and require more forage. Therefore, the old approach of regarding all cows, with or without calf as an AU is no longer recommended.

Animal size should be considered when matching livestock needs with available forage. The most widely recommended procedure uses the metabolic requirement ratio $(W)^{0.75}/(1000\ Pounds)^{0.75}$, where W is the weight (in pounds) of the animal, and a 1000-pound cow is defined as the basic AU. A rule of thumb is to adjust for changes in size on an animal unit equivalent by adding 0.1 AU for every 100 pound increase in live weight above the standard AU (Table 1). Figure 1 shows how the number of cows grazing a pasture should be adjusted to size.

Table 1. Calculating AUM Requirements of a Beef Cow with Calf under Four Months of Age

Weight of Cow	Daily Forage Dry Matter Intake (lbs)	Waste (25%)	Total Daily Requirement	Total Monthly Requirement
1000	22.0	5.5	27.5	839
1100	24.2	6.1	30.3	924
1200	26.4	6.6	33.0	1007
1300	28.6	7.1	35.7	1089
1400	30.8	7.6	38.4	1171

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Consumption, combined with a factor for trampling and waste of 25 percent results in an estimate of 839 pounds of forage to supply one AUM. The estimate of wastage varies with range and pasture condition and with level of grazing management. Efficiency of forage harvest increases and wastage decreases with higher levels of grazing management.

Animals consuming more or less forage than the standard animal due to differences in size, type, production level, etc. are assigned AU values based on their intake relative to the standard animal. For example, daily forage requirement of sheep (on a dry weight basis) average three percent of their body weight. Thus, five ewes (average weight 150 pounds) are one animal unit (Table 2). Larger ewes require more forage. Lambs also require forage from two months of age (average weight 15 pounds) through weaning (average weight 80 pounds). By considering each lamb at the age of two months to consume about one-third as much as a ewe, each lamb averages 0.3 x 0.2 AU, or 0.06 AU. Thus, 100 ewes with 100 lambs that are more than two months of age would represent: (100 ewes x 0.2 AU) + (100 lambs x 0.06 AU) = 26 AU. In contrast, if the ewes had a 170% lamb crop, the same flock would represent: (100 ewes x 0.2 AU) + (170 lambs x 0.06 AU) = 30 AU.

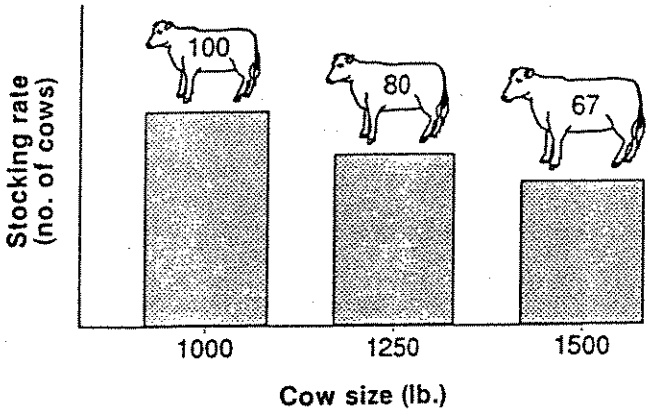

Figure 1. The number of animal units (1000-pound cow with calf less than four months of age) that can graze a field with a carrying capacity of 100 AUMs for one month declines as cow size increases. (Taken from Range Notes, No. 8, Prepared by Alberta Public Lands Range Management Program, Dec. 1989).

Table 2. Calculating AUM Requirements of a Ewe with Lamb under Two Months of Age.

Weight of Ewe (lbs)	Daily Forage Dry Matter Intake (lbs)	Waste (25%)	Total Daily Requirement	Total Monthly Requirement	AU Equivalent
150	4.5	1.1	5.6	171	0.20
175	5.3	1.3	6.6	201	0.24
200	6.0	1.5	7.5	229	0.27

AUM values for other kinds and classes of livestock are listed in Table 3. For example, yearling cattle (12-17 months) vary in weight from 600 to 900 pounds during the grazing season. As a rule of thumb, they are assigned 0.75 AU; thus, they consume 503 pound or [(30.5 days per month) x (22 pounds x 0.75)] of forage per month. The .75 rating should be adjusted accordingly for "light" and "heavy" yearlings. Mature bulls require more feed than a cow-calf pair and are considered to be 1.5 AU. As calves approach four months of age, forage intake increases and eventually becomes more important nutritionally than milk. Thus, from four months until weaning, calves require an average of 0.3 AU of forage monthly. For example, a 1200 pound cow with a 450 pound calf in October would be regarded as 1.5 AU or [(1200 pound cow = 1.2 AU + (calf = 0.3 AU)]. Each calf is assumed to be about 0.5 AU from weaning until they reach 12 months of age.

Table 3. Animal unit values (AU) for different kinds and classes of livestock and wildlife. The standard for this guide is based on forage intake of a spring calving cow (1000 pound average milking ability) and her calf (less than four months in age).

Kind/Class of Animal	AU	# of Animals Equal to 1 AU
Cow (1000 lb) and calf (spring calving, above average milking ability, first 3-4 months postpartum)	1.00	1.0
Cow (1000 lb) non-lactating	0.90	1.1
Calf (spring calving, 3-4 months postpartum to weaning)	0.30	3.3
Replacement heifers (18-24 months)	1.00	1.0
Yearling cattle (Long; 12-17 months)	0.75	1.4
Yearling cattle (Short; 7-12 months)	0.50	2.0
Young bulls (12-24 months)	1.20	0.8
Bulls (24-60 months)	1.50	0.6
Yearling horses	0.75	1.3
Two-year-old horses	1.00	1.0
Mature horses	1.25	0.8
Mature lactating ewe (150 lb) and lamb (less than 2 months in age)	0.20	5.0
Mature non-lactating ewe (150 lb)	0.18	5.5
Lamb (2 months to weaning)	0.06	16.7
Lamb (weaned to yearling)	0.12	8.3
Lamb (yearling)	0.15	6.6
Ram	0.25	4.0
Goat (mature)	0.15	6.6
Kid (yearling)	0.10	10.0
White-tailed deer	0.15	6.6
Mule deer	0.20	5.0
Antelope	0.20	5.0
Bison (cow)	0.90	1.1
Bison (bull)	1.50	0.66
Elk	0.60	1.7
Moose	1.00	1.0
Bighorn	0.20	5.0
Mountain goat	0.15	6.6
Blacktailed jackrabbit	0.016	62
Whitetailed jackrabbit	0.02	48
Columbian ground squirrel	0.003	385
Prairie dogs	0.004	256

Game and non-game animals also consume forage. Accurate determinations are complicated by incomplete knowledge of quantitative forage requirements, their dietary habits compared with domestic stock, the efficiency of animals in making use of feeds and the extent to which they utilize the same areas as domestic stock. Therefore, the estimated comparative feed requirements of game and domestic stock should be used with caution (Table 3).

The big game numbers in Table 3 apply to mature animals. Just as offspring of livestock are considered to exert additional demand for forage when they reach two to four months of age, offspring of wildlife should also be considered. Failure to do so will underestimate grazing use, and could lead to range deterioration.

Balancing livestock numbers with available forage is a basic goal and principle of range management. Forage productivity benefits when livestock are evenly distributed, spring grazing is delayed, and plants are provided periods of rest between grazing periods. Information about stocking rates, range condition, rainfall, and grazing patterns should be collected and evaluated. Grazing management programs should be adjusted when the need arises.

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